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Response Under 37 CFR 1.116
Expedited Procedure
Examination Group 1724

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application Of:

Stephen E Jacobson et al

Serial No.: 09/989,880

Filed: 11/21/2001

For: Low Temperature Alkali Metal
electrolysis

Confirmation No. 1503

Case No.: CH2804 US NA

Group Art Unit: 1742

Examiner: Harry D Wilkins III

RESPONSE AFTER FINAL REJECTION

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

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Sir:

Responsive to the 10/21/2003 Office Action, applicants submit the following remarks and request the examiner to withdraw the final rejection.

Claims 1-13, 23, and 24 were rejected under 35 USC 102(b) over Angell (US 5,855,809). The rejection is traversed for the following reasons.

As the examiner noted, applicants did not argue whether Angell discloses an electrolyte containing $\text{Cl}_3\text{PNSO}_2\text{Cl}$. Therefore, applicants submit that the Angell disclosure at column 6, lines 19-55 is not disputed. The question is whether Angell discloses or suggests electrolysis using the electrolyte for the production of an alkali metal at the cathode and a halogen at the anode.

First, an electrochemical reaction does not have to be electrolysis. For example, page 38 of Hawley's Condensed Chemical Dictionary (attached to this response) defines "electrochemistry" as chemical bonding, ionization, electrolysis, metallurgy, battery, fuel cells, and corrosion.

Here, Angell expressly discloses (column 1, line 39 to column 2, line 47) a reversible electrochemical deposition of alkali metals under charging conditions and stripping of alkali metals under discharging conditions in an electrochemical cell.

That is, Angell merely discloses a reduction-oxidation cycle, such as battery charging-recharging system in which an alkali metal in the quasi-salt solution is first

reduced and then re-oxidized to form a salt solution. Under such electrochemical reaction, there is no net metal and halogen gas production.

Secondly, Angell specifically discloses a cyclic voltammogram (CV) between certain voltage ranges. See, e.g., FIG. 1, -3, 6, and 8-9 as well as column 2, line 50 to column 3, line 34. Such CV is carried out in a dynamic, non-steady state mode, which is contrary to electrolysis. For example, FIG. 9 illustrates an overlay of two CV sweeping at the voltage at 5 mV/s and 10 mV/s. At 10 mV/s, the voltage is either increased or decreased at 1 volt every 100 seconds. *See also* FIG. 11-12.

Thirdly, such CV is also a reduction and oxidation with peak occurred where alkali metal (lithium here) may be expected to be involved based on thermodynamic voltage equivalent of the free energy change for lithium ion to lithium metal.

For example, Angell discloses (column 6, lines 55-61) that FIG. 1 shows a positive current flow *corresponding* to Li deposition at about -4.0 V versus a platinum pseudo-reference electrode, and a subsequent negative peak corresponding to *stripping of the deposited alkali metal back into the solution*. More of the alkali metal was *stripped back into solution* with repeated scans (marked as 1st, 2nd and 3rd in FIG. 1) (*italics added*). It is clear that Angell does not disclose that Li is actually isolated and recoverable as in electrolysis. It merely suggests that a positive current flow is produced in which the current flow is *corresponding* to Li deposition. An actual deposition/isolated/recoverable and a current flow *corresponding* to Li deposition are different.

Fourthly, as the present claims recite, halogen gas is produced at the anode. Halogen gas is evolved and cannot be “re-dissolved” to produce a halide electrolyte in an electrolysis. Once halogen gas evolves, the alkali metal CANNOT be *stripped back into the solution* because there are no more halide counter ions to form a salt. Similarly, if an alkali metal is deposited and removed (claim 26 and its dependent claim), the original electrolyte solution cannot be formed again.

Here, Angell expressly discloses *stripping the deposited alkali metal back into the solution*. The clear conclusion is that there is no electrolysis being carried out and no halogen can be inherently produced at the anode. Had halogen gas been inherently produced, metal should not have been stripped back to produce a solution because there are no available halogen counter ions.

Office Action, page 2, section 3, also asserted that Angell adds an electrolyte . . . to an electrolytic cell and carries out an electrolysis. The “electrolysis” term was also repeated many times in the Office Action, which also cited claims 32-43 (page 6, section 6) to imply that Angell discloses an “electrolytic cell”. Angell discloses in claims 32-43 a “device”. As discussed above, Angel discloses an oxidation-reduction (charging-discharging) reaction. The device disclosed in Angell would best be deduced as “battery”, which also involves electrochemical reaction.

However, in the four corners of Angell disclosure, no “electrolysis” or “electrolytic” word can be found. Any other suggestion appears speculative.

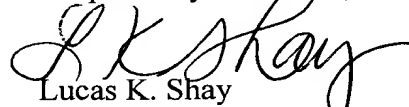
In conclusion, Angell does not disclose an electrolysis and electrolytic cell. These terms are not found in the disclosure. As discussed above, an electrochemical reaction is not necessarily an electrolysis.

Because Angell does not disclose an electrolysis process, rejection of claims 2-13 and 24 are submitted to become moot.

Claims 14-22 and 25-32 were rejected under 35 USC 103(a) over Angell and Müller. The rejection is traversed because, as discussed above, Angell does not disclose or suggest electrolysis. The arguments presented above is incorporated herein.

For the foregoing reasons and discussions, applicants respectfully request that the objections and rejections be withdrawn.

Respectfully submitted,



Lucas K. Shay

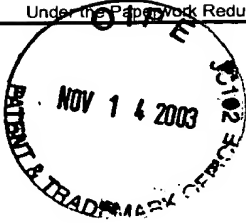
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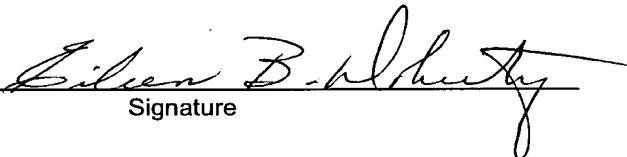
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Response After Final Rejection

Hawley's Condensed Chemical Dictionary, page 38

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